7.2 MAINSTEM RESERVOIR SYSTEM HYDROLOGY

This section of Chapter 7 focuses on the hydrologic variation that will result from the operation of the Mainstem Reservoir System under the modified conservation plan (MCP) and the four GP options (GP1528, GP2021, GP2028, and GP1521) designed to address Gavins Point Dam release changes for the three listed species provided protection under the ESA. Total storage, individual lake elevations, and river flows in all of the reaches will vary as drought conservation increases under the MCP, increased spring release are made from Fort Peck Dam, and the magnitude of the spring rise and summer low flows vary under the GP options.

7.2.1 Mainstem Reservoir System Storage and Lake Elevations

In the hydrologic modeling process, lake levels and total system storage are two hydrologic features important to those whose livelihoods and responsibilities are associated with one or more of the mainstem lakes. Table 7.2-1 displays the minimum system storage levels and minimum lake levels for the upper three lakes for the CWCP, the MCP, and the four GP options. Minimum levels are presented for each of the three major droughts experienced during the 100-year period of record as well as for the period of actual historic operation from 1967 to 1997. The system storage represents the minimum daily total of the combined volume of the six mainstem lakes during each drought period: the 1930 to 1941 drought, the 1954 to 1961 drought, and the 1987 to 1993 drought. Minimum daily lake levels for the upper three lakes (Fort Peck Lake, Lake Sakakawea, and Lake Oahe) during each drought period are also presented. Minimum lake elevations for the other three mainstem lakes (Lake Sharpe, Lake Francis Case, and Lewis and Clark Lake) are not provided. These lakes are much smaller than the upper three, representing only 12 percent of the total storage, and their operation, and therefore, their lake levels, do not vary significantly with the different alternatives.

Table 7.2-1. Minimum system storage (MAF) and lake levels for the upper three lakes (feet).

	System Storage		Fort Peck Lake		Lake Sakakawea		Lake Oahe	
Alternative	**Date**	**MAF**	**Date**	**Level (feet)**	**Date**	**Level (feet)**	**Date**	**Level (feet)**
1930-1942 Drought								
CWCP	Sep-41	18.7	Jun-41	2,157	Feb-37	1,773	May-41	1,537
MCP	Feb-40	27.2	Mar-40	2,181	Mar-40	1,793	Feb-40	1,559
GP1528	Mar-41	26.4	Mar-41	2,179	Mar-41	1,791	Feb-41	1,558
GP2021	Feb-41	25.7	Mar-41	2,178	Feb-41	1,790	Feb-40	1,556
GP1521	Feb-41	25.8	Mar-41	2,178	Oct-40	1,790	Feb-40	1,556
GP2028	Mar-41	26.1	Mar-41	2,178	Mar-41	1,790	Feb-41	1,557
1954-1962 Drought								
CWCP	Dec-61	40.1	Mar-62	2,206	Feb-62	1,813	Aug-61	1,586
MCP	Dec-61	42.1	Mar-62	2,209	Feb-62	1,817	Aug-55	1,588
GP1528	Dec-61	45.5	Mar-62	2,215	Feb-62	1,821	Aug-55	1,587
GP2021	Dec-61	44.6	Aug-61	2,213	Feb-62	1,820	Aug-55	1,588
GP1521	Dec-61	44.7	Aug-61	2,213	Feb-62	1,820	Aug-55	1,588
GP2028	Dec-61	45.5	Mar-62	2,215	Feb-62	1,821	Aug-55	1,587
1987-1993 Drought								
CWCP	Jan-93	40.2	Apr-91	2,206	Mar-93	1,813	Aug-90	1,585
MCP	Jan-93	42.7	Mar-93	2,209	Feb-91	1,817	Aug-90	1,586
GP1528	Jan-93	43.3	Mar-93	2,206	Mar-93	1,818	Aug-92	1,588
GP2021	Jan-93	43.4	Mar-93	2,206	Mar-93	1,819	Aug-92	1,590
GP1521	Jan-93	43.3	Mar-93	2,206	Mar-93	1,819	Aug-92	1,590
GP2028	Jan-93	43.3	Mar-93	2,206	Mar-93	1,818	Aug-92	1,588
Historic Minimums								
1967-1997	Jan-91	40.8	Apr-91	2,209	May-91	1,815	Nov-89	1,581

The minimum system storage levels modeled during the three droughts under the MCP and all four GP options are higher than those under the CWCP. One of the objectives of the MCP and the GP options was to retain water in the system lakes during times of drought.

The MCP consists of the same conservation measures as the MRBA alternative discussed in Chapter 5, but also includes a spring rise downstream from Fort Peck Dam. The MCP results in a minimum system storage of approximately 27.2 MAF during the 1930 to 1941 drought, the same as the MRBA alternative. The GP options are similar to the MCP, but include a spring rise below Gavins Point Dam and a lower summer release. These options result in slightly lower minimum system storages than the MCP during the 1930 to 1941 drought, ranging from 26.4 MAF for the GP1528 option to 25.7 MAF for the GP2021 option. Although there is little variation among the GP options, the two with the lowest summer flows (GP2021 and GP1521) result in slightly lower minimum storage levels during the 1930 to1941 drought because their lower summer flows allow for a longer navigation season (navigation season length was based on minimum storage level of about 43 MAF in the 1987 to 1993 drought). As a result, they end the navigation season with less total storage and this loss is carried over to the early part of the following year prior to the start of the spring runoff.

During the less severe droughts, 1954 to 1961 and 1987 to 1993, the MCP and the four GP options again result in higher system storages than the CWCP due to the higher drought conservation measures. The minimum system storage under the MCP is 2.0 MAF higher than the CWCP in the 1954 to 1961 drought, and 2.5 MAF higher in the 1987 to 1993 drought. The GP options are higher yet, ranging from 2.5 to 3.4 MAF higher than the MCP during the 1954 to 1961 drought and 0.6 to 0.7 MAF higher than the MCP in the 1987 to 1993 drought. The GP options with the lowest summer releases result in the lowest minimum system storage during the 1954 to 1961 drought, as in the 1930 to 1941 drought. During the 1987 to 1993 drought, minimum system storages are essentially the same for all GP options.

Comparing the MCP and the four GP options to the actual historic operation during the period of record (which only includes the 1987 to 1993 drought), all of the alternatives result in a higher minimum system storage than actually occurred during the latest drought.

Variations in the lake elevations of the upper three lakes are similar to the total system storage because the storage in the three lakes makes up nearly 90 percent of the total system storage. However, there are minor variations due to the unique operating objectives of the individual lakes, such as unbalancing and the Fort Peck Dam spring rise, which can affect the timing and distribution of storage in the system. In general, all of the alternatives result in higher lake levels than the CWCP during the three drought periods. This is because the alternatives have increased drought conservation measures.

The MCP provides significantly higher minimum lake levels than the CWCP for the upper three lakes during the 1930 to 1941 drought. Increases in minimum lake levels are 24, 20, and 32 feet, respectively, for Fort Peck Lake, Lake Sakakawea, and Lake Oahe. For the lesser droughts—1954 to 1961 and 1987 to 1993—the MCP again provides higher minimum lake levels than the CWCP for the upper three lakes, but on a much smaller scale. At Fort Peck Lake, the minimum lake level is 3 feet higher under the MCP than the CWCP for both droughts; Lake Sakakawea is 4 feet higher under the MCP than the CWCP for both droughts; and Lake Oahe is 2 feet higher during the 1954 to 1961 drought and 1 foot higher during the 1987 to 1993 drought.

The four GP options have nearly identical minimum pool elevations for the upper three lakes during the three drought periods, with variations between the GP options generally limited to 1 to 2 feet. In the 1930 to 1941 drought, the GP options result in minimum lake levels at all three lakes that are slightly below the MCP. The GP options are 1 to 2 feet lower than the MCP at Fort Peck Lake, 2 to 3 feet lower than the MCP at Lake Sakakawea, and 1 to 3 feet lower at Lake Oahe.

During the two lesser droughts, the four GP options result in minimum lake levels that range from 6 feet above to 3 feet below the MCP. During the drought of 1954 to 1961 the GP options result in a minimum pool 4 to 6 feet higher than the MCP at Fort Peck Lake, and 3 to 4 feet higher at Lake Sakakawea. However, Lake Oahe's minimum level during the 1954 to 1961 drought is as much as 1 foot lower with the GP options than with the MCP.

During the 1987 to 1993 drought, minimum Fort Peck Lake levels are 3 feet lower under the four GP options than under the MCP, essentially equivalent to the CWCP. Lake Sakakawea is 1 to 2 feet higher with the GP options than the MCP during the 1987 to 1993 drought, and Lake Oahe is 2 to 4 feet higher with the GP options.

In summary, all of the alternatives result in generally higher minimum system storage and lake levels during the three drought periods than under the CWCP. The MCP results in the highest minimum storage and lake levels during the 1930 to 1941 drought, but is generally equivalent to or lower than the GP options during the lesser droughts. The differences among the GP options are generally small, ranging from 0 to 2 feet. These minor differences in the GP options can be attributed to changes in timing and distribution of releases from Gavins Point Dam that result in minor differences in minimum system storages and lake elevations.

7.2.2 Fort Peck Dam Release

A spring rise out of Fort Peck Dam for the benefit of native fish species is included in all of the alternatives to the CWCP discussed in this chapter. Although all of the alternatives include the spring rise below Fort Peck Dam, there are minor differences due to the timing associated with the different Gavins Point Dam release patterns. The modeling results for the various alternatives are presented on Figures 7.2-1 through 7.2-3 as a derivative of a flow duration-type analysis. The figures indicate the percent of years that a given discharge, either 18 or 23 thousand cubic feet per second (kcfs), is equaled or exceeded for various durations during the months of May and June. Increased releases of 23 kcfs for 3 weeks from Fort Peck Dam in the mid-May through June timeframe approximately every third year were recommended as a starting point in the USFWS BiOp. Although the USFWS goal was to release 23 kcfs for 3 weeks, some benefit is derived even if the goal is not fully met; therefore, a release of 18 kcfs is also discussed in the analysis model results.

Figure 7.2-1 compares the MCP and the GP1528 option—both of which have a spring rise below Fort Peck Dam—to the CWCP, which does not have a Fort Peck spring rise. The MCP is effective at providing a spring rise of 23 kcfs for 2 weeks about 20 percent of the time. The GP1528 option, which is a logical starting point for the GP options because it has the least amount of variation from the CWCP, is slightly more effective than the MCP at providing a spring rise of 23 kcfs for about 2 weeks, meeting that goal about 23 percent of the time. Both the MCP and the GP1528 options provide a 18 kcfs spring rise about 30 percent of the time.

Figure 7.2-2 compares the GP1528 and GP2021 options. Although the differences between the two options are minor, GP1528 is slightly better than GP2021 in providing a spring rise from Fort Peck Dam. GP1528 provides the 23 kcfs spring rise for 14 days, an additional 2 percent of the years compared to GP2021.

Figure 7.2-3 compares GP1528 with the GP1521 and GP2028 options. Again, GP1528 increases the percent of years where the spring rise is achieved 2 to 3 percent of the years compared to the other options.

In summary, the GP1528 option provides a 23 kcfs spring rise in the greatest percent of years when compared to the other alternatives.

7.2.3 Lake Sakakawea Elevations

The State of North Dakota indicated that it has water quality concerns at Lake Sakakawea when the pool is drawn down below elevation 1,825 feet. To facilitate the water quality analysis for Lake Sakakawea, Figures 7.2-4 through 7.2-6 were developed to compare the number of days that Lake Sakakawea was below elevation 1,825 feet during the three historic drought periods in the Missouri River basin under the various operating scenarios.

For background purposes, the carryover-multiple use zone under the CWCP extends from elevation 1,775 to 1,837.5 feet. The actual historic minimum pool level at Lake Sakakawea during the 1987 to 1993 drought was 1,815.0 feet.

As simulated using the Daily Routing Model (DRM), Lake Sakakawea is drawn down below 1,825 feet for a period of many years under all of the operating alternatives during the drought of 1930 to 1941. As shown in Figure 7.2-4, Lake Sakakawea was drawn down the longest under the CWCP, nearly 12 consecutive years during the 1930 to 1941 drought. The MCP, with its increased drought conservation measures, results in fewer days below 1,825 feet in the early years of the drought, from 1931 to 1933, and also allows for a quicker recovery at the end of the drought than the CWCP. GP1528 is similar to the MCP in the early years of the 1930 to 1941 drought, but recovers even quicker than the MCP at the end of the drought. Only the GP2021 option is shown on Figure 7.2-4. The other GP option with minimum service summer low flows, GP2028, has a low lake level nearly identical to the GP1528 option and, therefore, is not shown in Figure 7.2-4. The remaining two GP options, GP1521 and GP2021, are similar to GP1528 in the early years of the 1930 to 1941 drought, but recover slower than either the GP1528 option or the MCP at the end of the drought. The primary difference between the GP options is whether or not navigation is supported during particular years of the drought. GP1528 and GP2028 do not support navigation during 1942, which results in retention of water in the upper lakes. This allows Lake Sakakawea to recover a little quicker than with the GP1521 and GP2021 options.

Figure 7.2-5, representing the1954 to 1961 drought, shows considerably more difference among the CWCP, the MCP, and the GP options. During the 1954 to 1961 drought, the MCP is considerably better than the CWCP because of its additional conservation measures, but still results in Lake Sakakawea dropping below 1,825 for at least a short period of time each year between 1957 and 1962. In contrast, all of the GP options reduce the time spent below 1,825 feet during the 1954 to 1961 drought to a short duration in 1961 and 1962. There is essentially no difference among the GP options.

During the 1987 to 1993 drought, as shown in Figure 7.2-6, the MCP results in Lake Sakakawea spending less time below 1,825 than the CWCP. The results for the GP1528 and GP2028 options are identical to each other and, with the exception of 1989, result in fewer days below 1,825 feet than the MCP. The GP2021 and GP1521 options also are identical, and are consistently lower than the other two GP options. The volume and timing of releases to support navigation account for the primary difference in the durations that Lake Sakakawea is below 1,825 feet for the GP options.

In summary, the MCP results in Lake Sakakawea spending less time below 1,825 feet than the CWCP. The GP options reduce the duration spent below 1,825 feet even further than the MCP.

7.2.4 Bismarck Flow Duration

A flow duration-type analysis was done using the DRM results at Bismarck. In the analysis, the number of days during the April to June timeframe when flows at Bismarck exceed 55 kcfs was totaled for each year in the 100-year period of record and a duration-type analysis was performed. Flood damages in the Bismarck area begin when flows exceed the 55 to 60 kcfs range. Figures 7.2-7 through 7.2-9 compare the results of the analysis for the CWCP, the MCP, and the four GP options: GP1528, GP2021, GP1521, and GP2028.

As shown in Figure 7.2-7, the CWCP and the MCP result in very similar flow patterns at Bismarck. However, the effect of the Gavins Point Dam spring rise in the GP1528 option is noteworthy. In order to support a spring rise from Gavins Point Dam, higher releases need to be passed down through the system. The result is a slight increase in the number of days that flows at Bismarck exceed 55 kcfs during the April through June period.

Figure 7.2-8 compares the GP1528 and GP2021 options. Although the GP2021 option has a higher spring rise (20 kcfs rather than 15 kcfs), there is essentially no difference between the flow duration curves at Bismarck. This is further reinforced by Figure 7.2-9, which shows no difference in the flow duration at Bismarck for the GP1528, GP1521, and GP2028 options.

In summary, the GP options result in a slight increase in the time flows at Bismarck exceed 55 kcfs over both the CWCP and MCP.

7.2.5 Gavins Point Dam Release

The six alternatives discussed in this chapter have widely varying Gavins Point Dam releases, depending on the existence and magnitude of the spring rise and summer low flows that differentiate the alternatives. Neither the CWCP nor the MCP have a spring rise or low summer flows, although the MCP has more conservation measures than the CWCP. These conservation measures reduce service to navigation during times of drought. The four GP options are differentiated by the magnitude of the spring rises and summer low flows. The GP1521 and GP1528 options have a 15-kcfs spring rise out of Gavins Point Dam, while the GP2021 and GP2028 options have a 20-kcfs spring rise. Likewise, the GP1521 and GP2021 options have low summer flows of 21 to 25 kcfs from late June through the end of August, whereas the GP1528 and GP2028 options have a minimum service flat release of 28.5 kcfs during that time frame. The differences among the alternatives described in the following paragraphs can also be used to describe flow changes downstream from Fort Randall Dam.

The varying Gavins Point Dam releases are directly observable in the release duration plots developed for each month (January -December) using average monthly Gavins Point Dam releases for the period of record. The results are presented on 12 monthly figures each displaying the CWCP, the MCP, and the GP1528 and GP2021 options. Figures 7.2-10 through 7.2-21 allow a month-by-month comparison of the alternatives. The discussion here, however, is limited to pointing out the major differences among the plans.

Between January and March, Figures 7.2-10 through 7.2-12, the duration curves for the various alternatives are, for the most part, quite similar in the range and frequency of the Gavins Point Dam release. In particular, the MCP has slightly higher releases than the CWCP between January and March. The GP options have a slightly different shape in the months of January and February than the MCP, but the overall differences are minor.

In April, a significant dichotomy in the duration curves becomes apparent (Figure 7.2-13). The MCP is nearly identical to the CWCP, but the GP options require higher releases during April in wet years because of the release restrictions imposed later in the summer. These alternatives indicate much higher April releases, up to 10 kcfs, than the MCP, which does not include a spring rise out of Gavins Point Dam. The GP option with minimum service summer flow, GP1528, has a duration curve significantly higher than the MCP. This duration curve is, however, slightly lower than the GP option with the more restricted summer flows, GP2021.

The effects of the spring rise, which was modeled from mid-May through mid-June, are most evident in the duration curves for May (Figure 7.2-14). The CWCP and the MCP have nearly identical release duration curves that are significantly lower than the GP options. The GP option with the 15-kcfs spring rise, GP1528, ranges from several kcfs higher than the MCP to as much as 15 kcfs higher. The 20-kcfs spring rise option, GP2021, results in the highest releases, generally about 5 kcfs higher than the 15-kcfs spring rise option.

In June, the Gavins Point Dam release duration curves for the CWCP and the MCP are very similar once again. Furthermore, because the GP options have high Gavins Point Dam releases during the first half of June and low releases during the second half of the month, the average monthly flows depicted in Figure 7.2-15, are generally in the same range as the MCP. If June flows had been subdivided between the first and second halves of the month, the results would have been similar to those of May and July, respectively.

In July and August, Gavins Point Dam releases for the CWCP and the MCP are the highest, followed by the GP option with minimum service flows from late June through the end of August. The GP option with the 25/21/25 low summer flows, GP2021, has the lowest Gavins Point Dam releases.

After the low summer flows in the GP options, Gavins Point Dam releases are increased in order to evacuate the remaining excess water in the system storage between September and November (Figures 7.2-18 through 7.2-20). Release duration curves for the GP options are significantly higher than the CWCP and the MCP curves. The November release duration curve also indicates the shortened navigation season required in 35 to 40 percent of the years under the MCP and the GP1528 option.

December's duration curves for the CWCP, the MCP, and the GP options (Figure 7.2-21) are once again quite similar, although there is some variation in the Gavins Point Dam release at the end of the navigation season. The minimum winter release, 12 kcfs, is consistent across the range of alternatives.

7.2.6 Nebraska City Flow Duration

Along the Lower River below the Mainstem Reservoir System, the magnitude, timing, and duration of high flows may affect landowners through direct flooding, high groundwater, and/or interior drainage flooding. Because the duration of high flows is a significant factor, the modeling results for the various alternatives are presented on Figures 7.2-22 through 7.2-24 as a derivative of a flow duration-type analysis. In the analysis, the number of days during the April to July timeframe when flows at Nebraska City exceed 55 kcfs was totaled for each year in the 100-year period of record, and a duration-type analysis was performed. Landowners in the Nebraska City area begin to experience interior drainage problems when flows in the Missouri River approach 55 kcfs. Figures 7.2-22 through 7.2-24 compare the results of the analysis for the CWCP, the MCP, and the four GP options. Because the flows at Nebraska City are highly influenced by the Gavins Point Dam releases, the differences among the alternatives follow a similar pattern.

Figure 7.2-22 shows that, while the MCP duration curve is nearly identical to that of the CWCP, the GP1528 option with its spring rise results in more days with flows above the 55 kcfs level during the period of April through July. Likewise, Figure 7.2-23, comparing the GP1528 and GP2021 options, shows that, for the most part, as the magnitude of the spring rise increases, the frequency and duration of flows above 55 kcfs at Nebraska City also increases. This is also indicated on Figure 7.2-24 where the GP2028 option results in the most days above 55 kcfs at Nebraska City.

In summary, although there is very little difference between the CWCP and the MCP flow duration at Nebraska City, the GP options result in an increase in the percent of time that 55 kcfs is exceeded.

7.2.7 Boonville Flow Duration

A similar analysis was performed for flows at Boonville, Missouri. Figures 7.2-25 through 7.2-27 show a duration-type analysis of the number of days during the May through June time frame that flows at the Boonville gage exceed 90 kcfs. Long duration, high flows on the Lower River can restrict releases from tributary lakes. Releases from the Kansas River tributaries begin to be restricted when flows at Waverly, Missouri are greater than 90 kcfs. Waverly is not a control point in the DRM; however, Boonville is the next downstream control point.

For the May through June period, Figure 7.2-25, comparing the CWCP to the MCP and the GP1528 option, shows essentially no difference between the flow duration curves for the CWCP and the MCP. The flow duration curve at Boonville for the GP1528 option is slightly higher than the MCP, averaging several additional days with flows above 90 kcfs at Boonville.

Figures 7.2-26 and 7.2-27, comparing the four GP options, show a very slight increase in the number of days with flows above 90 kcfs for the GP options with the highest spring rises: GP2028 and GP2021.

In summary, the spring rise from Gavins Point Dam provided by the GP options results in a very minor increase in the number of days during the May to June timeframe that the flows at Boonville are in excess of 90 kcfs.

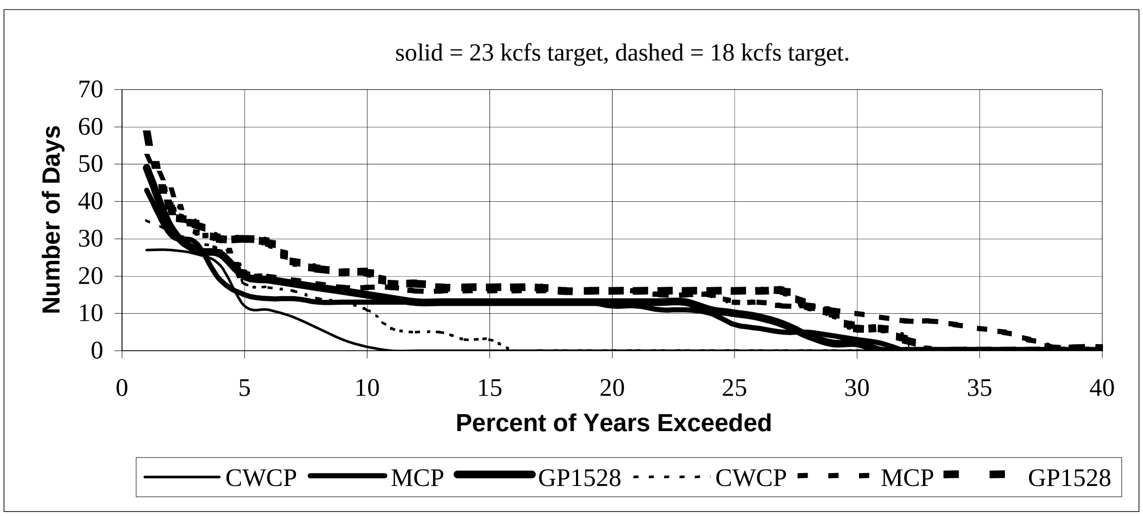

Figure 7.2-1. Number of days in May/June that Fort Peck releases exceed target for CWCP, MCP, and GP1528.

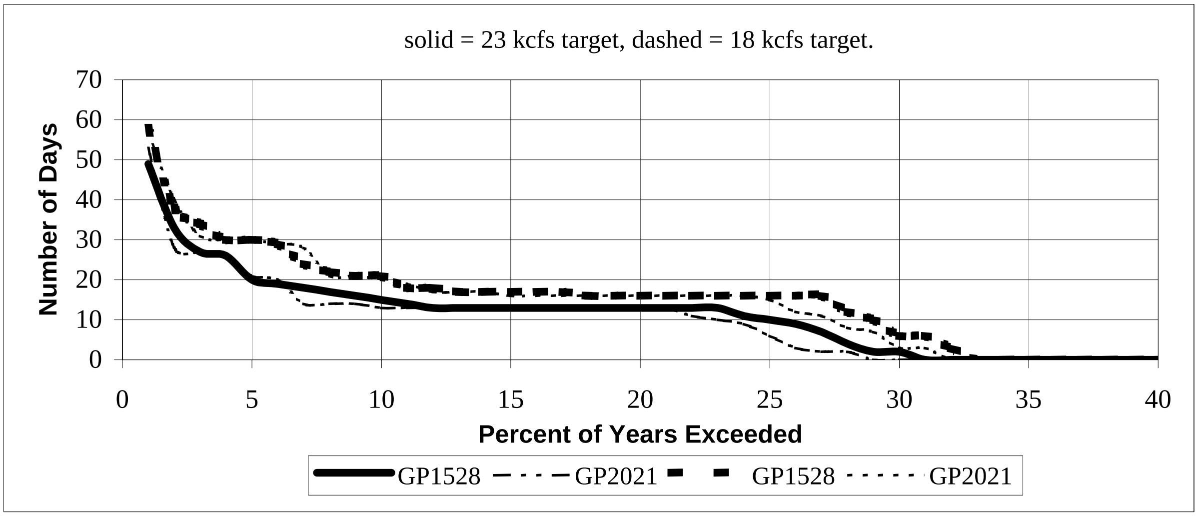

Figure 7.2-2. Number of days in May/June that Fort Peck releases exceed target for GP1528 and GP2021.

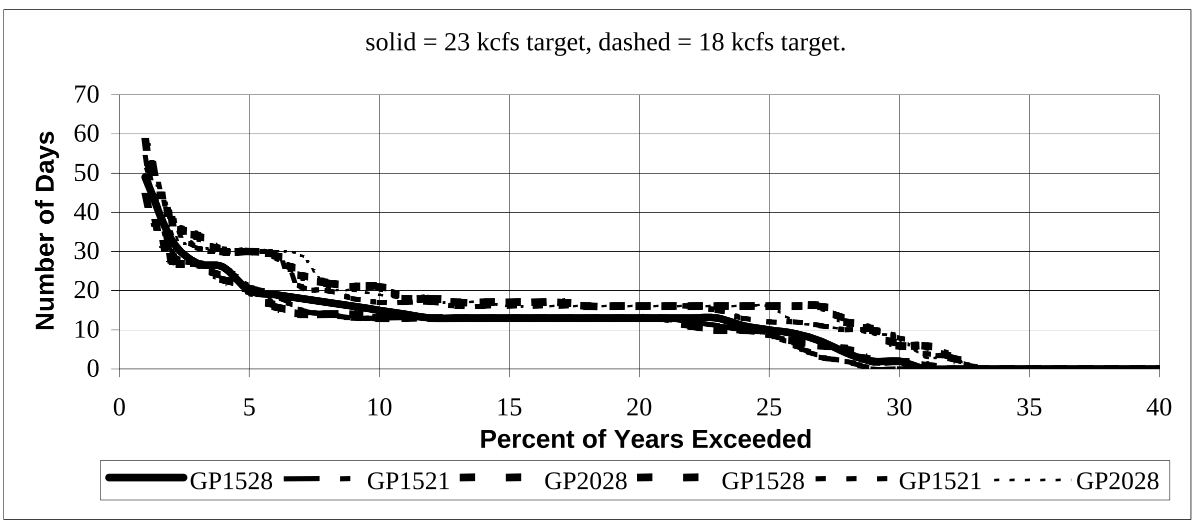

Figure 7.2-3. Number of days in May/June that Fort Peck releases exceed target for GP1528, GP1521, and GP2028.

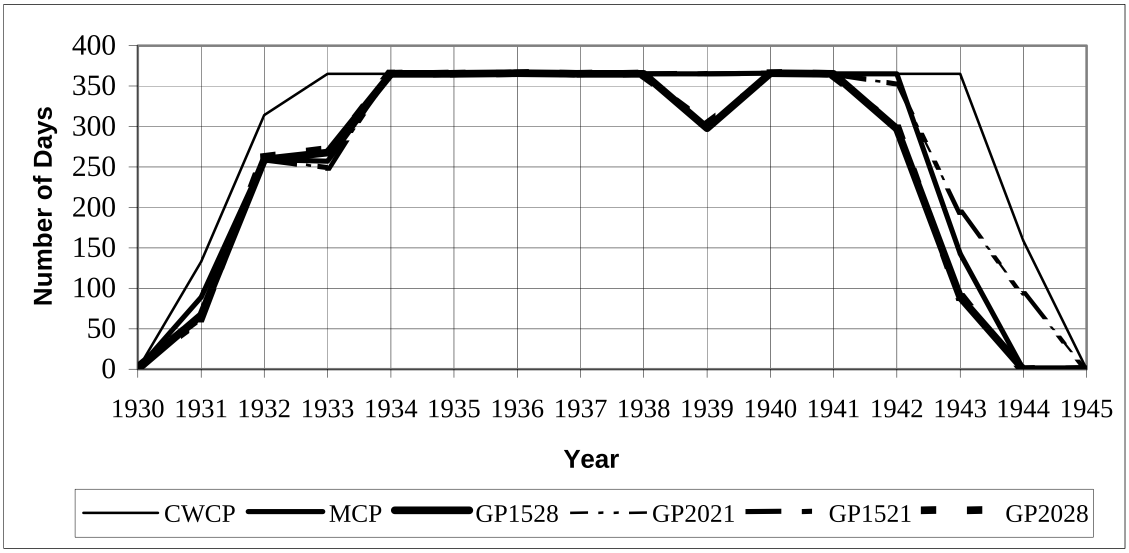

Figure 7.2-4. Number of days per year Lake Sakakawea is below elevation 1,825 feet: 1930 to 1941 drought.

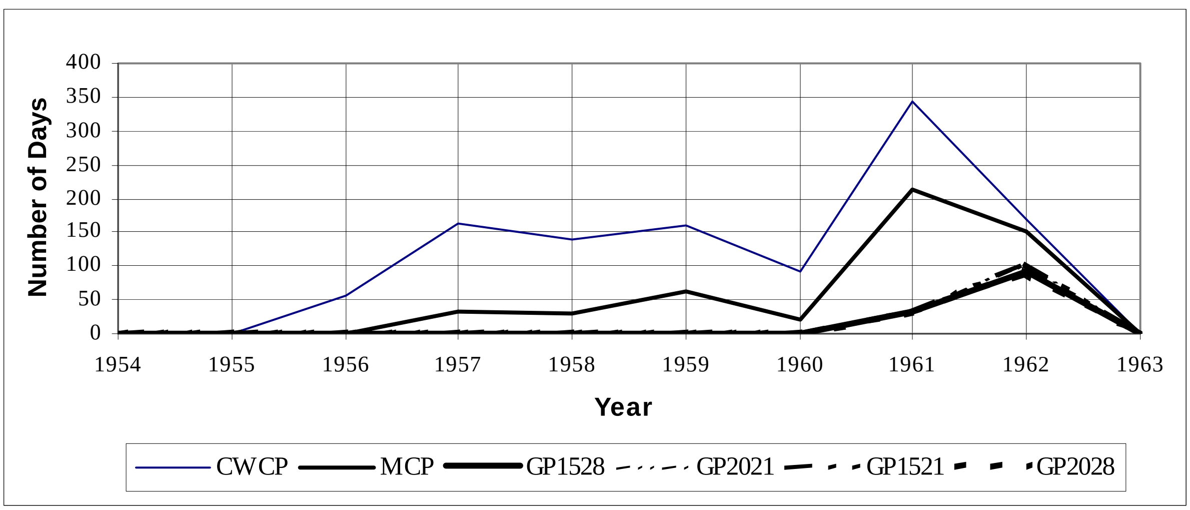

Figure 7.2-5. Number of days per year Lake Sakakawea is below elevation 1,825 feet: 1954 to 1961 drought.

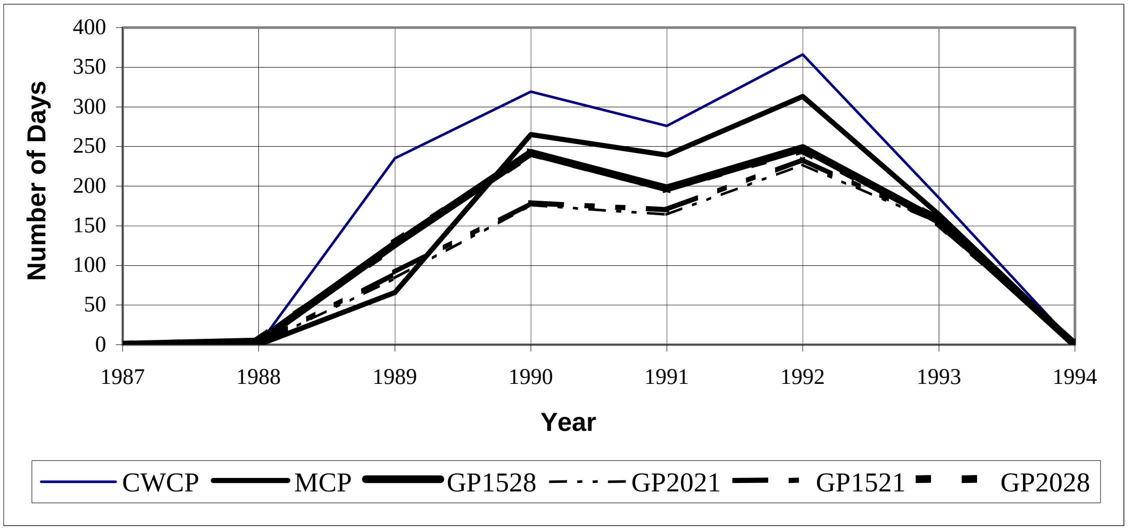

Figure 7.2-6. Number of days per year Lake Sakakawea is below elevation 1,825 feet: 1987 to 1993 drought.

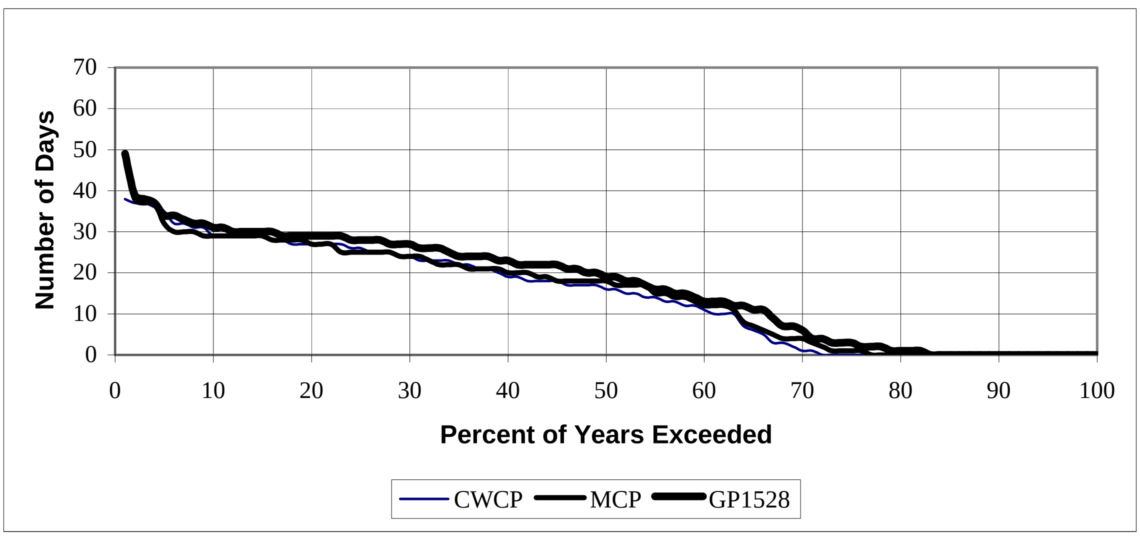

Figure 7.2-7. Missouri River at Bismarck: Number of days flows exceed 55 kcfs, April to June for CWCP, MCP, and GP1528.

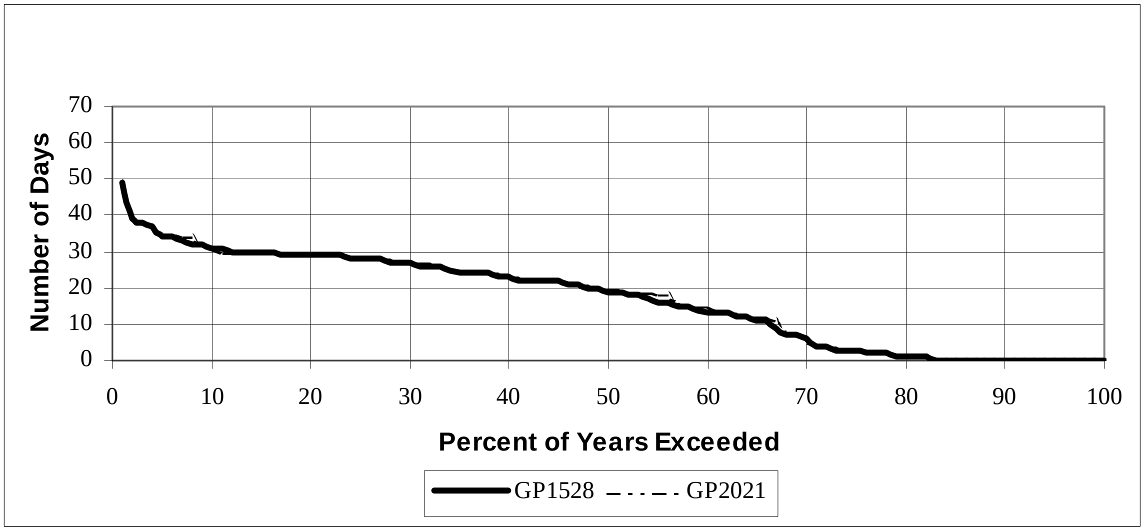

Figure 7.2-8. Missouri River at Bismarck: Number of days flows exceed 55 kcfs, April to June for GP1528 and GP2021.

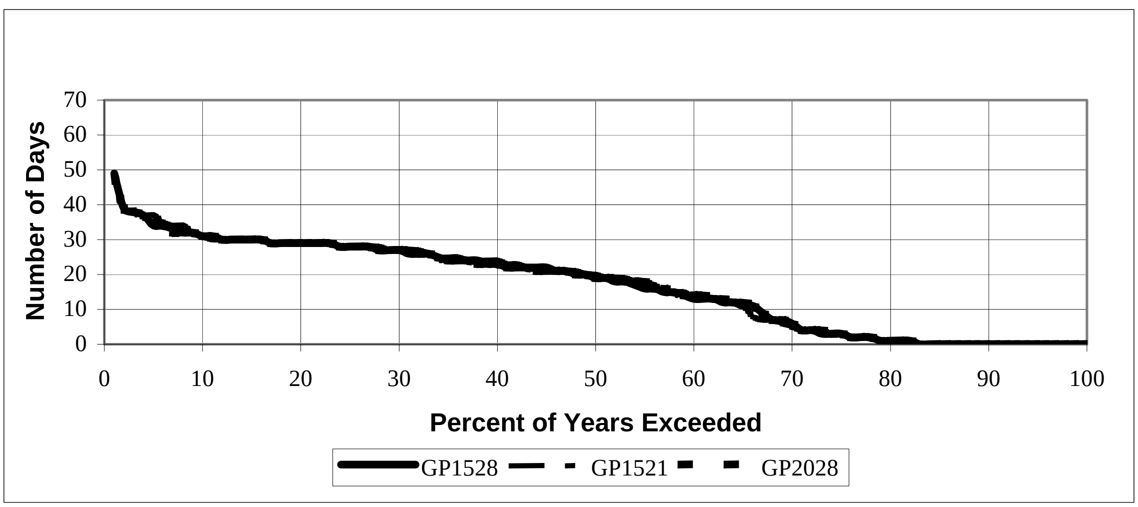

Figure 7.2-9. Missouri River at Bismarck: Number of days flows exceed 55 kcfs, April to June for GP1528, GP1521, and GP2028.

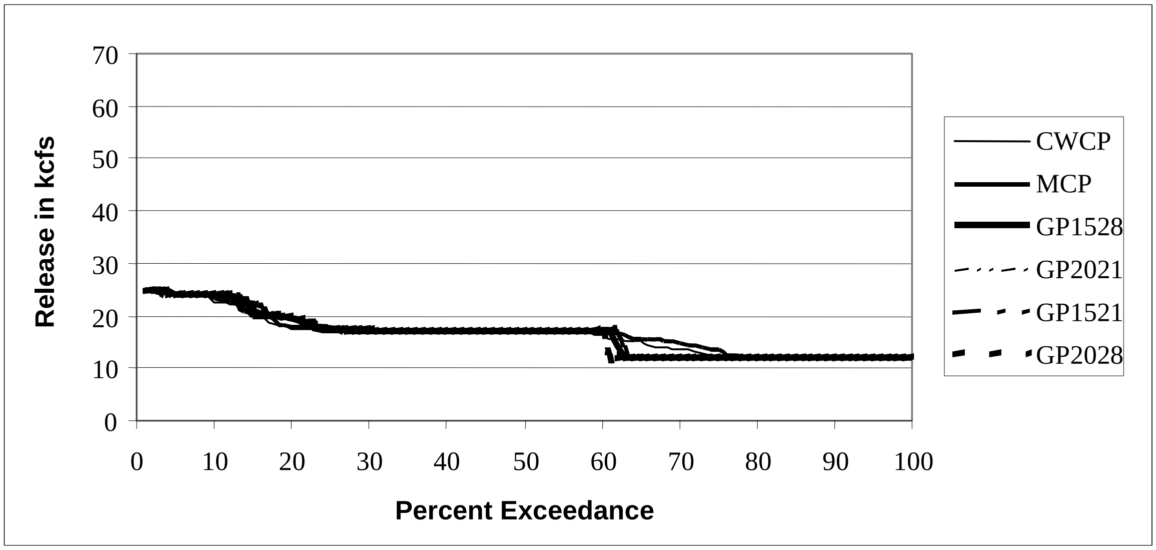

Figure 7.2-10. Gavins Point Dam release duration, January.

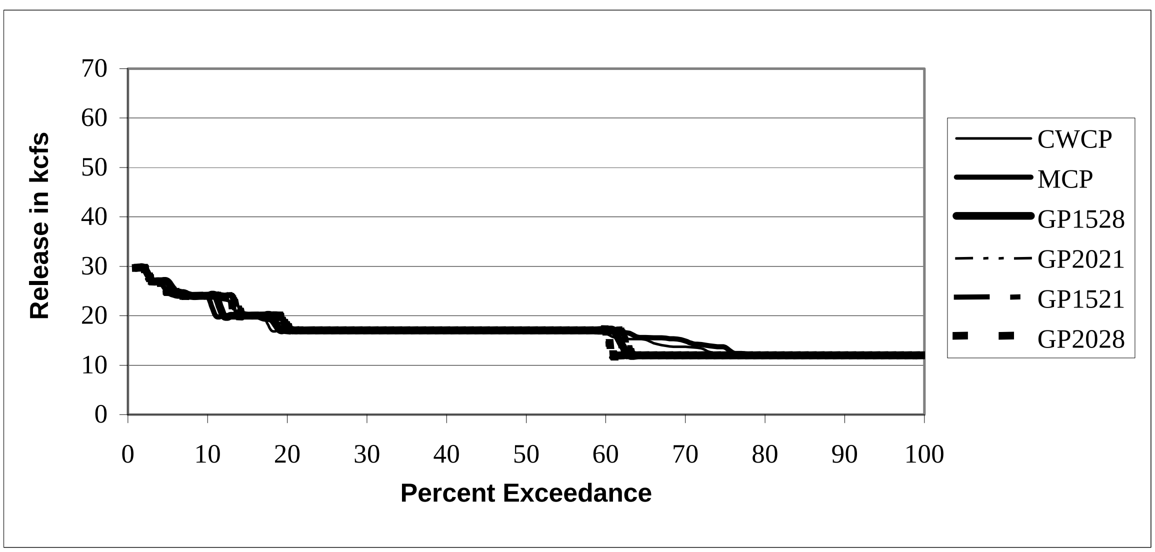

Figure 7.2-11. Gavins Point Dam release duration, February.

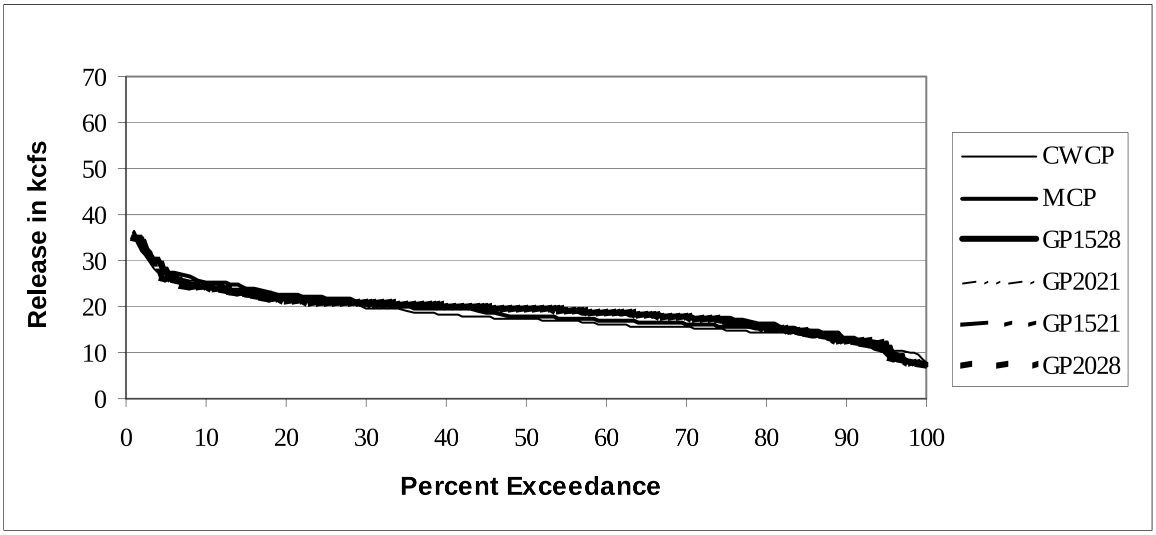

Figure 7.2-12. Gavins Point Dam release duration, March.

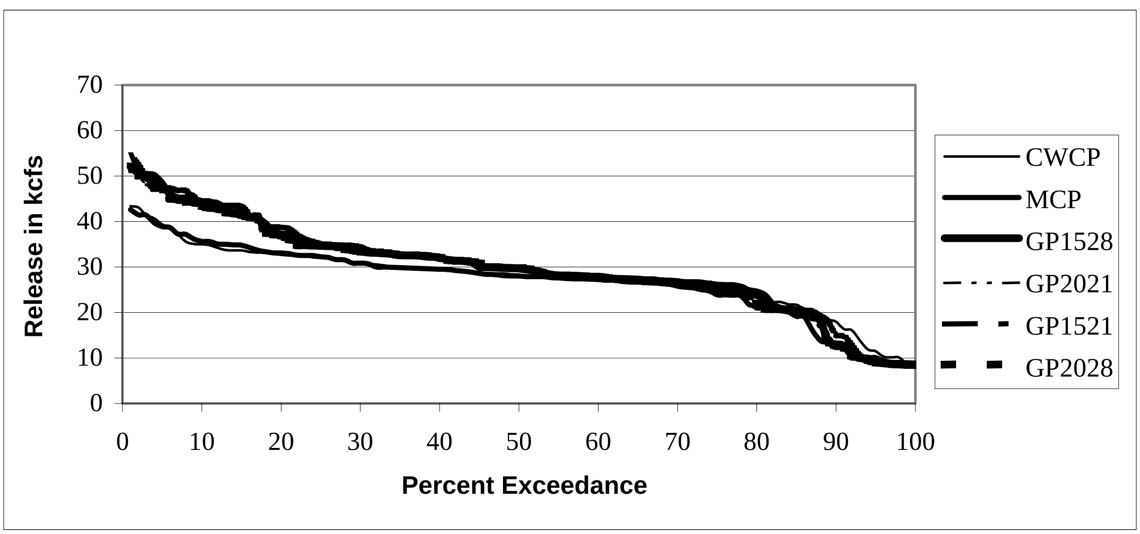

Figure 7.2-13. Gavins Point Dam release duration, April.

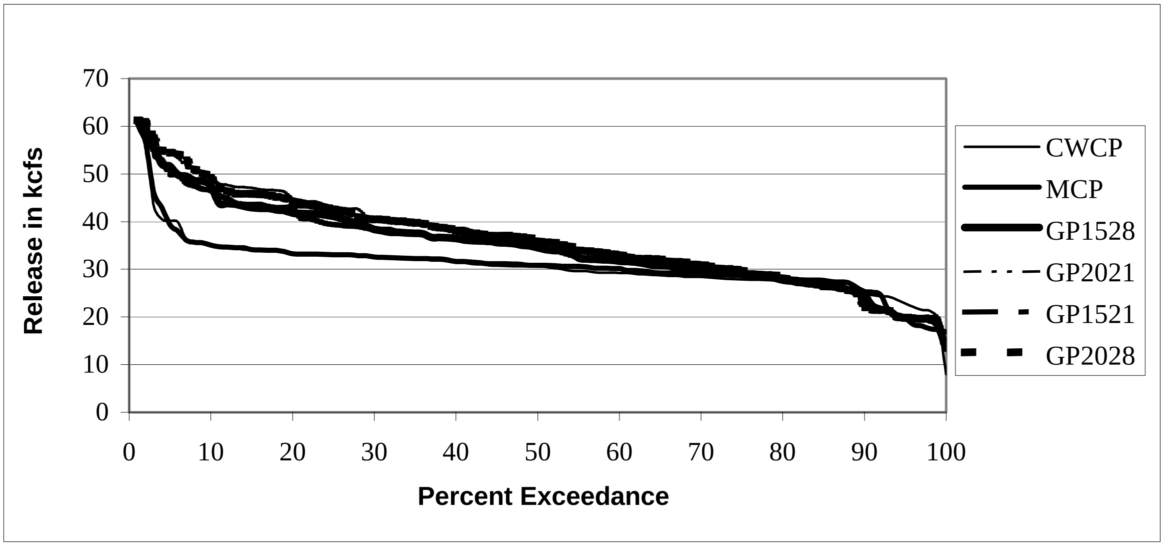

Figure 7.2-14. Gavins Point Dam release duration, May.

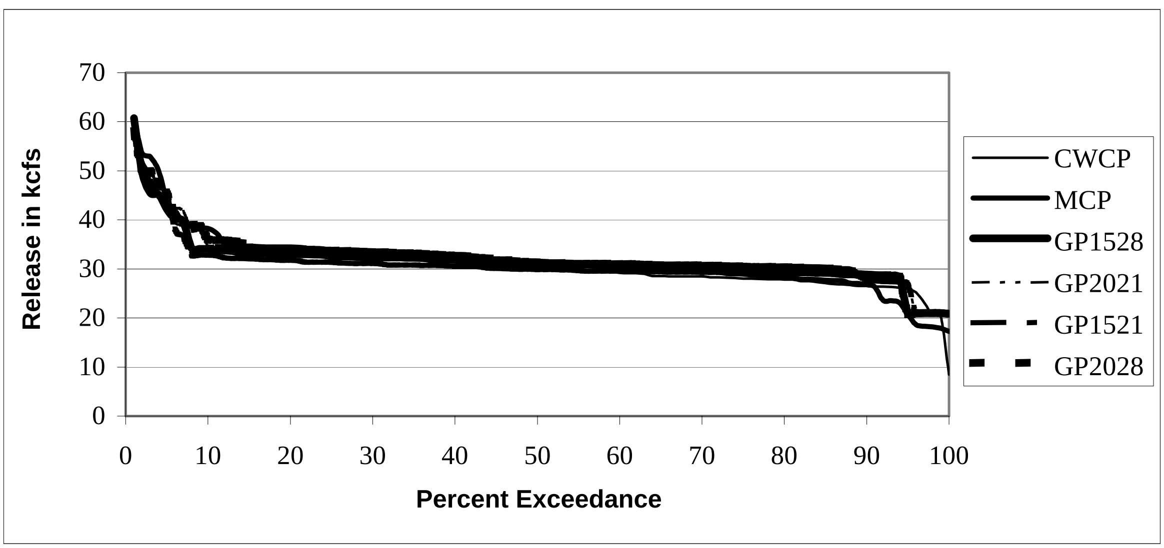

Figure 7.2-15. Gavins Point Dam release duration, June.

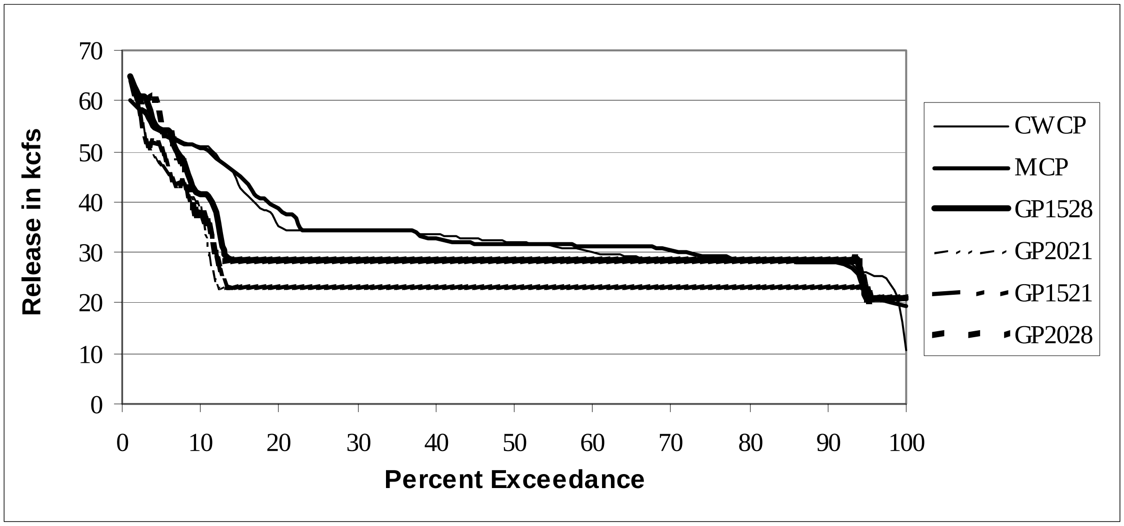

Figure 7.2-16. Gavins Point Dam release duration, July.

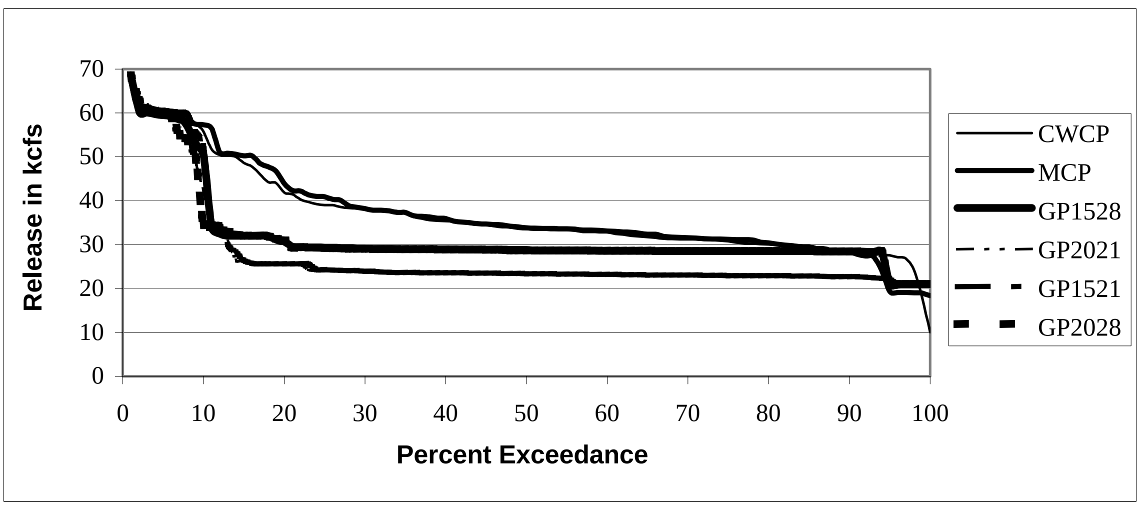

Figure 7.2-17. Gavins Point Dam release duration, August.

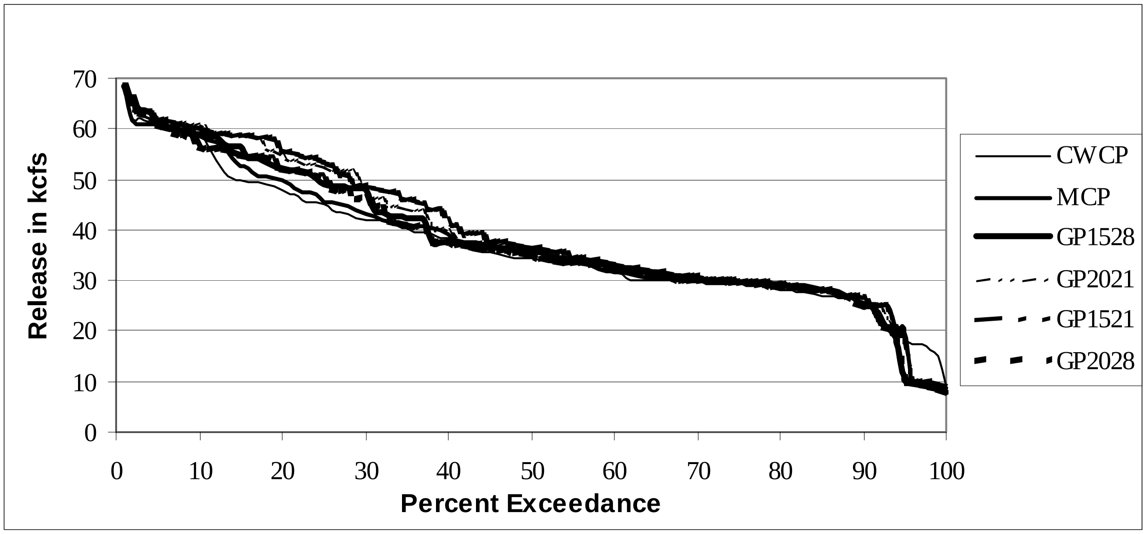

Figure 7.2-18. Gavins Point Dam release duration, September.

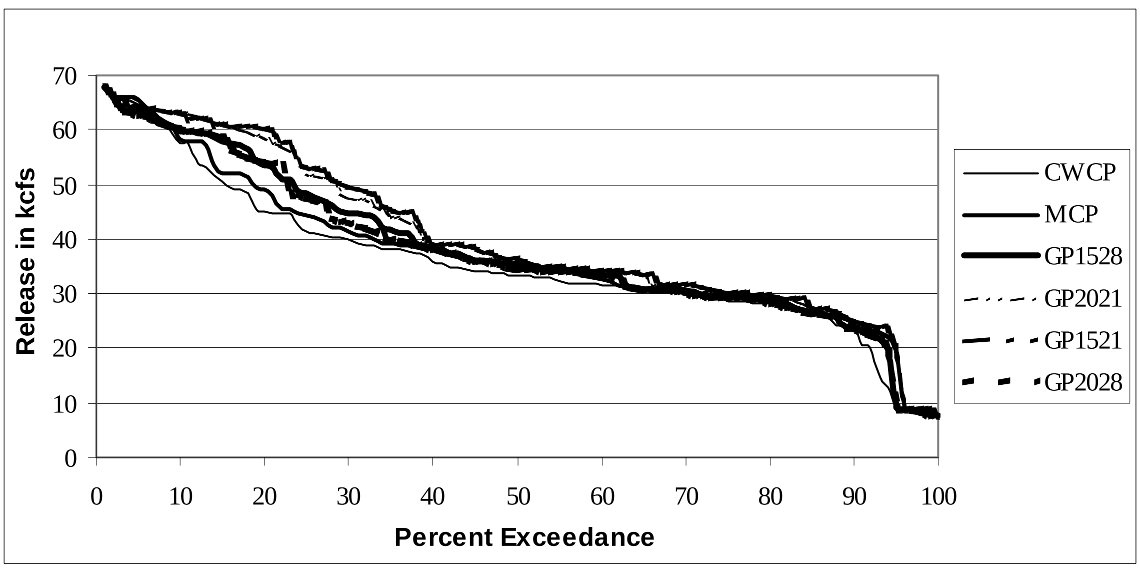

Figure 7.2-19. Gavins Point Dam release duration, October.

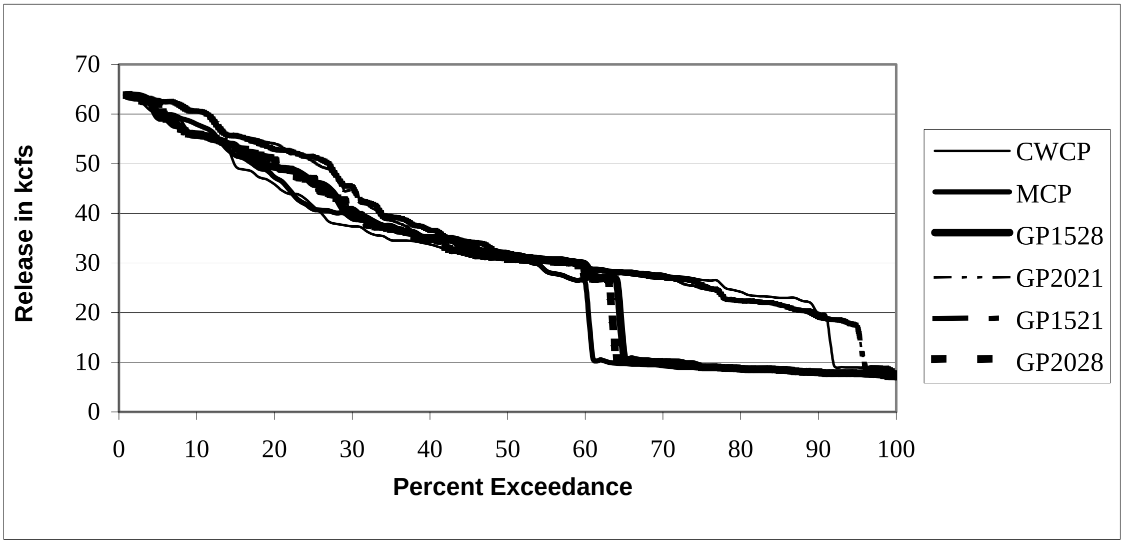

Figure 7.2-20. Gavins Point Dam release duration, November.

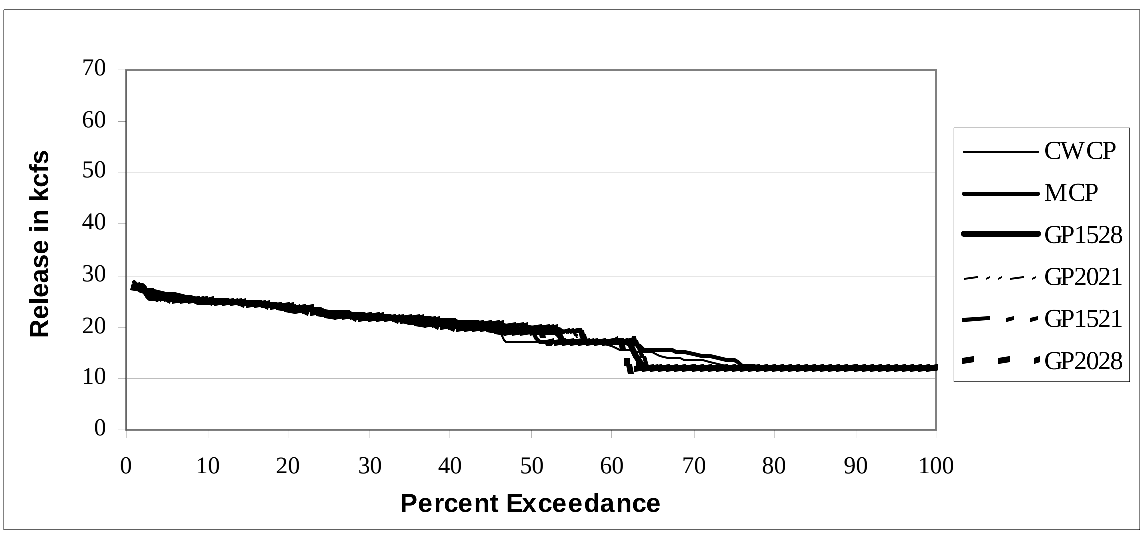

Figure 7.2-21. Gavins Point Dam release duration, December.

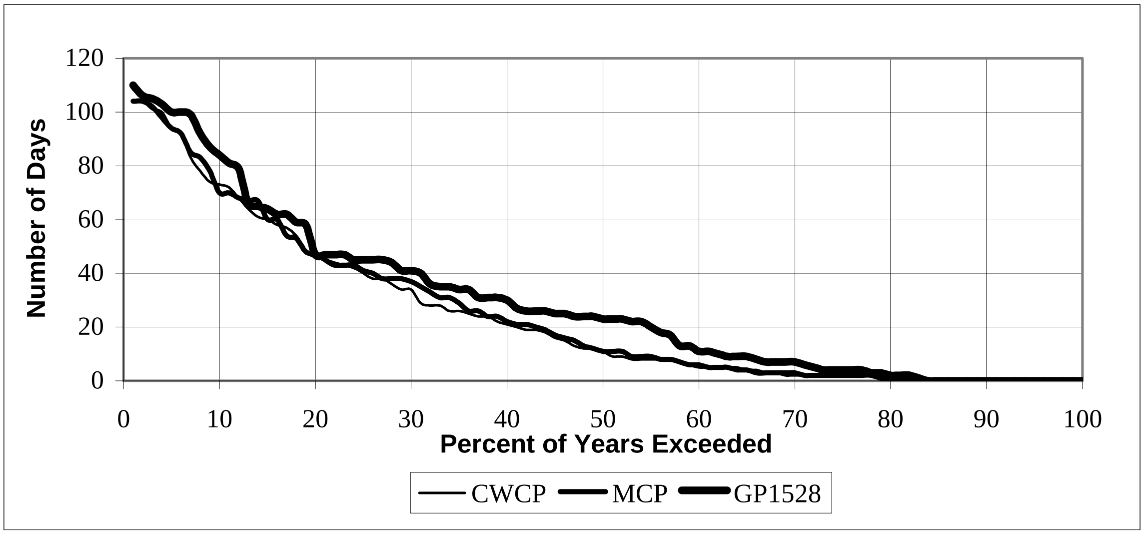

Figure 7.2-22. Missouri River at Nebraska City: Number of days flows exceed 55 kcfs, April to July for CWCP, MCP, and GP1528.

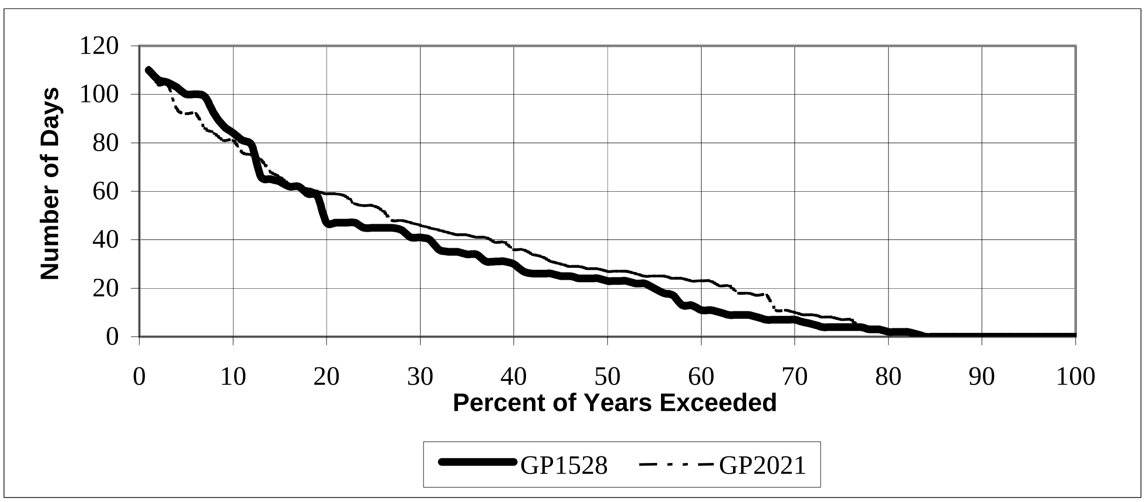

Figure 7.2-23. Missouri River at Nebraska City: Number of days flows exceed 55 kcfs, April to July for GP1528 and GP2021.

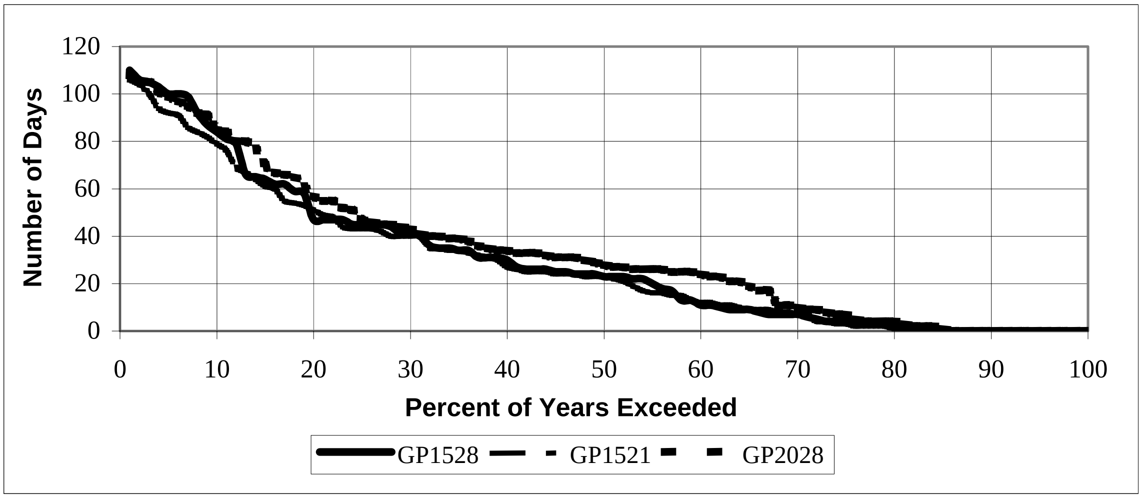

Figure 7.2-24. Missouri River at Nebraska City: Number of days flows exceed 55 kcfs, April to July for GP1528, GP1521, and GP2028.

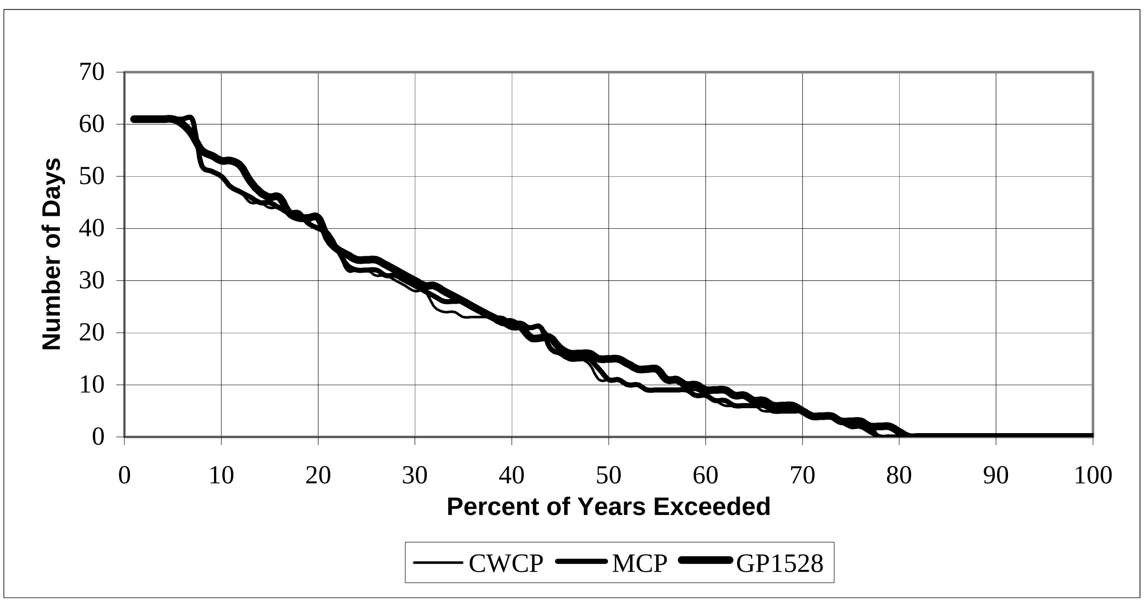

Figure 7.2-25. Missouri River at Boonville: Number of days flows exceed 90 kcfs, May to June for CWCP, MCP, and GP1528.

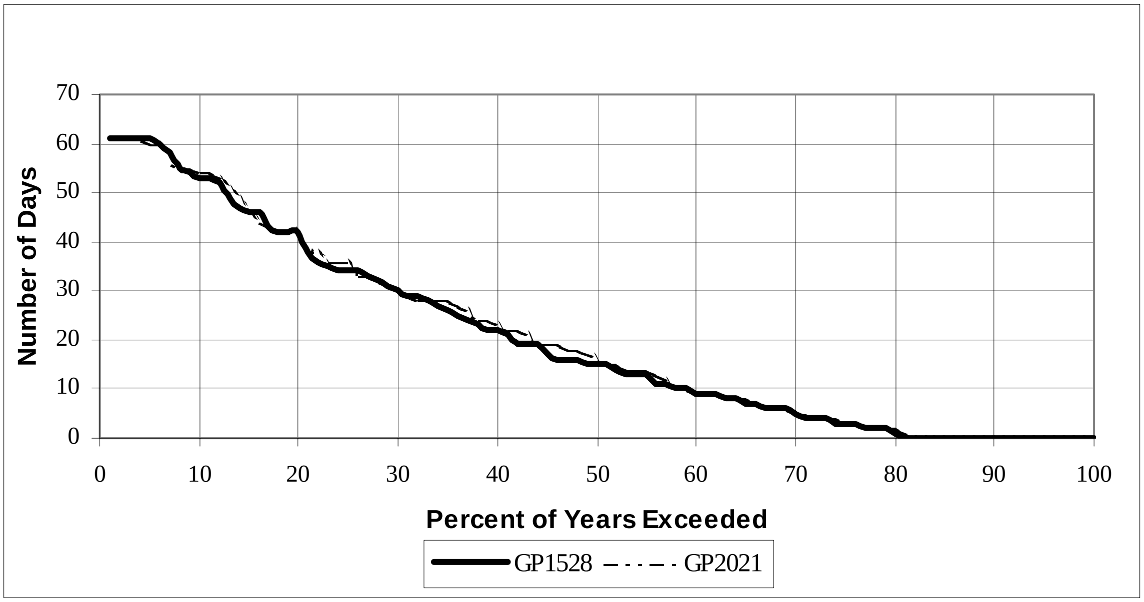

Figure 7.2-26. Missouri River at Boonville: Number of days flows exceed 90 kcfs, May to June for GP1528 and GP2021.

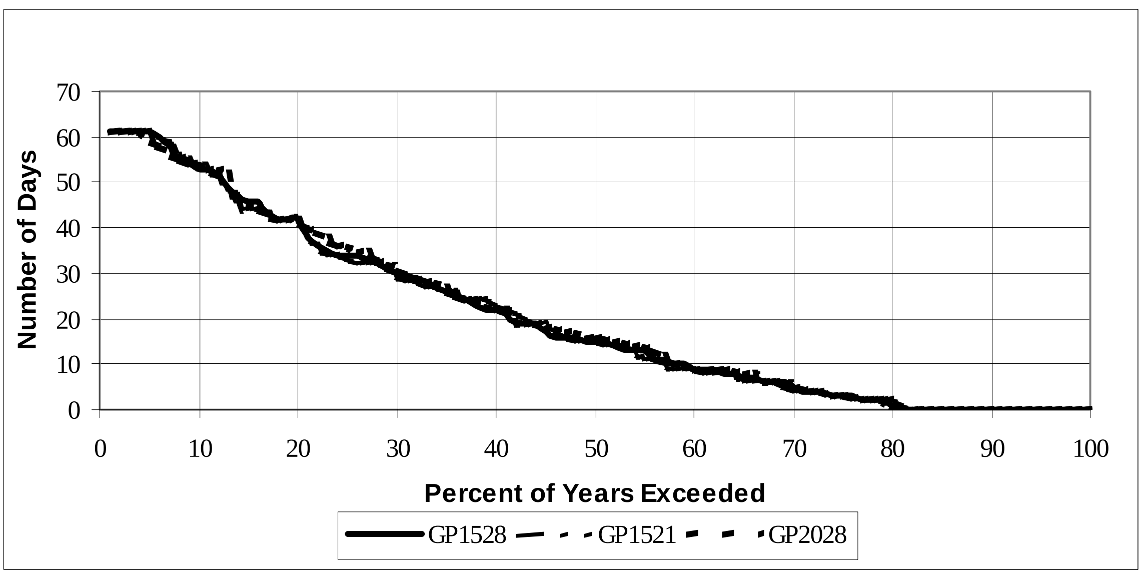

Figure 7.2-27. Missouri River at Boonville: Number of days flows exceed 90 kcfs, May to June for GP1528, GP1521, and GP2028.

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